

THREE NEW SPECIES OF STRONGYLOID NEMATODES FROM *THYLOGALE STIGMATICA* (GOULD, 1860) AND *THYLOGALE THETIS* (LESSON, 1828) (MARSUPIALIA: MACROPODIDAE)

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Summary

GRIFFITH, J. E. (1999) Three new species of strongyloid nematodes from *Thylogale stigmatica* (Gould, 1860) and *Thylogale thetis* (Lesson, 1828) (Marsupialia: Macropodidae). *Trans. R. Soc. S. Aust.* 123(2), 53-60. 31 May, 1999.

Thylonema woodalli sp. nov. is described from the stomach of the pademelons *Thylogale stigmatica* and *T. thetis* from Queensland. *Thylonema woodalli* differs from congeners in the shape of the buccal capsule. *Thylonema clelandae* sp. nov. is described from the stomach of the pademelon, *Thylogale stigmatica*. *Thylonema clelandae* differs from congeners in the shape of the buccal capsule, the sclerotised folds in the oesophageal bulb, lip-like structures in the buccal capsule and lack of an annulus in the wall of the buccal capsule. *Thylostrongylus franklinae* sp. nov. is described from the stomach of the pademelon, *Thylogale stigmatica* from Queensland. It differs from congeners in the proportions of the buccal capsule, the prominence of striations of the buccal capsule, spicule length, the origin of the dorsal ray and overall size.

KEY WORDS: *Thylogale stigmatica*, *Thylogale thetis*, *Thylonema woodalli* sp. nov., *Thylonema clelandae* sp. nov., *Thylostrongylus franklinae* sp. nov., nematodes, new species, Macropodidae.

Introduction

The nematode parasites of the red-legged pademelon, *Thylogale stigmatica* Gould, 1860, from Queensland, include a highly distinctive series of species or genera either restricted to this host or occurring in closely related species (Beveridge *et al.* 1992; Spratt *et al.* 1991). However, although the helminth communities of *Thylogale stigmatica stigmatica*, Gould, 1860 have been investigated in areas north of Townsville (Beveridge *et al.* 1992), only a limited number of pademelons belonging to other species or subspecies has been examined in southern Queensland and northern New South Wales (Johnston & Mawson 1939; Beveridge 1982, 1983). During an investigation of the helminth communities of *Thylogale stigmatica wilcoxi* M'Coy, 1866 and *T. thetis* Lesson, 1828 collected from southern Queensland and northern New South Wales, several undescribed nematodes were encountered. This paper presents the description of two new species of *Thylonema* Beveridge, 1981 and one new species of *Thylostrongylus* Beveridge, 1982.

Materials and Methods

Pademelons were collected opportunistically as road kills and stored at -20°C. Carcasses were thawed

and a sample of stomach content was collected from various regions of the stomach and fixed in 10% formalin. Nematodes were removed from stomach content, washed in water, cleared in lactophenol, and examined using an Olympus BH2 microscope. Drawings were made with the aid of a drawing tube. Measurements are given in micrometers, unless otherwise stated, as the range followed by the mean in parentheses. Type specimens have been deposited in the South Australian Museum, Adelaide (SAMA).

Thylonema woodalli sp. nov. (FIGS 1-8)

Holotype: ♂, from the stomach of *Thylogale stigmatica wilcoxi* (M'Coy, 1866), Mount Glorious Queensland, 1994, coll. P. Woodall, SAMA AHC 31299.

Allotype: ♀ SAMA AHC 31300.

Paratypes: 3 ♂♂, 7 ♀♀, SAMA AHC 31301, 31302.

Other material examined: From *Thylogale stigmatica*: Queensland: 4 ♂♂, 2 ♀♀, Green Mountain, Lamington National Park, SAMA AHC 31305; 1 ♂, Palmerston, SAMA AHC 31325; from *Thylogale thetis*: Queensland: 1 ♂, 1 ♀, Lamington National Park, SAMA AHC 31306.

Description

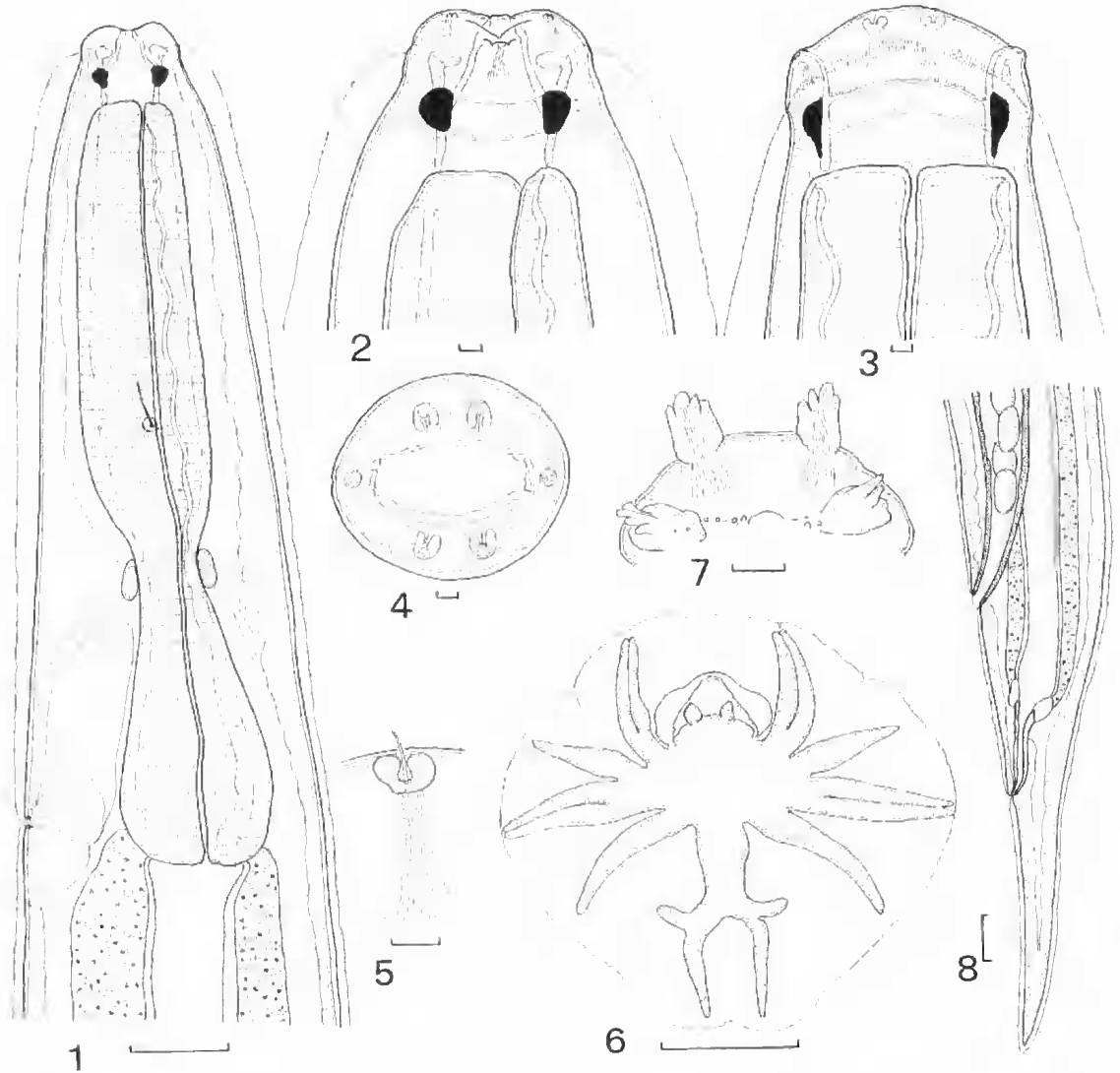
Small, whitish nematodes; body covered with

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numerous fine annulations; cephalic collar absent; mouth opening slit-like to oval, laterally elongated; two small amphids present on lateral extremities of mouth opening; dorsal and ventral lips each with two bilobed cephalic papillae; papillae not projecting above lips, bilobed medially, rounded laterally; single seta protruding between lobes; buccal capsule wider in dorsal than in lateral view, anterior and posterior extremities of wall poorly sclerotised; central region forming heavily sclerotised annulus; wall of buccal capsule thickened anteriorly on

dorsoventral and lateral aspects, terminating anteriorly, posterior to mouth opening in medially-directed expansions; buccal capsule wall tapering posteriorly; oesophagus elongate, corpus cylindrical, widening slightly posteriorly; isthmus short; bulb elongate, clavate, as wide as corpus; nerve ring encircling oesophagus at isthmus; deirids slightly anterior to nerve ring; secretory-excretory pore at oesophago-intestinal junction.

Male (Measurements of 8 specimens) (Figs 1-7)



Figs 1-8. *Thylonema woodalli* sp. nov. from the pademelons. *Thylogale stigmatica* and *T. thetis*. 1. Anterior end, lateral view. 2. Anterior extremity lateral view. 3. Anterior extremity dorsal view. 4. *En face* view of anterior extremity. 5. Submedian cephalic papilla, lateral view. 6. Bursa, apical view. 7. Genital cone, dorsal view. 8. Female tail, lateral view. Scale bars = 0.01 mm, 2-5; 0.1 mm, 1, 6-8.

Length 5.04-7.90 (6.72) mm; maximum width 280-480 (388); buccal capsule 35-45 (40) x 45-110 (84) in lateral view; oesophagus 600-840 (736); nerve ring to anterior end 420-580 (505); secretory-excretory pore to anterior end 690-840 (795); deirids to anterior end 370-410 (390). Bursal lobes not separated; ventral and lateral lobes joined, lateral lobes distinct from slightly longer dorsal lobe; ventral lobes joined ventrally; ventroventral and ventrolateral rays apposed, reaching margin of bursa; externolateral ray divergent from lateral trunk, almost reaching margin of bursa; mediolateral and posterolateral rays apposed, reaching margin of bursa; externodorsal ray arising close to lateral trunk, not reaching margin of bursa; dorsal ray dividing at mid-length into two slender arcuate branchlets, almost reaching margin of bursa; two small, lateral branches arising soon after level of major bifurcation; spicules narrow, elongate, alate, 1.7-2.2 (2.0) mm long; alae with fine transverse striations; anterior extremities of spicules irregularly knobbed; tips pointed; anterior lip of genital cone prominent, conical; posterior lip with two bulbous papillae and array of irregular projections dorsal to them; gubernaculum absent.

Female (Measurements of 10 specimens) (Fig 8)

Length 8.08-9.70 (8.48) mm; maximum width 390-550 (473); buccal capsule 35-50 (45) x 70-105 (80) in lateral view; oesophagus 700-860 (786); nerve ring to anterior end 490-570 (520); secretory-excretory pore to anterior end 770-950 (860); deirids to anterior end 430 (430); tail short, conical, 450-580 (505) long; vulva immediately anterior to anus, 820-1000 (899) from posterior end; ovejector longitudinally disposed; eggs thin-shelled, ellipsoidal, 70-110 (95) x 40-60 (51).

Site of infection

Stomach.

Etymology

Named in honour of Dr P. Woodall, Department of Anatomy, University of Queensland.

Remarks

The species falls within the strongyloid subfamily Cloaciniinae Stossich, 1899, based on the cylindrical buccal capsule, the longitudinally disposed ovejector, the origin of the externodorsal ray with the lateral rays and the two pairs of branches to the dorsal ray (Lichtenfels, 1980). It also has a poorly sclerotised buccal capsule with prominent annulus and lacks a leaf crown placing it within the tribe Coronostromylinea Beveridge, 1986.

The species is placed within the genus *Thylonema*

because of the laterally elongated mouth opening, the annular thickenings of the mid-region of the buccal capsule and the characteristic morphology of the cephalic papillae, which are bilobed medially, with a seta arising between the lobes of each papilla. Other genera of the Coronostromylinea, (*Coronostromylylus* Johnston & Mawson 1939, *Popovostromylylus*, Mawson 1977 and *Papillostromylylus* Johnston & Mawson, 1939) have conical cephalic papillae with one or two setae arising from the apex and are not bilobed.

The new species is distinguished from congeners by the morphology of the buccal capsule and the shape of its dorsal and ventral thickenings, features that distinguish other congeners (Beveridge 1981). The thickening of the buccal capsule in *Th. woodalli* appears to be a prominent ring of material encircling the mid-region of the buccal annulus as in *Th. thylonema*. *Thylonema arundeli* has a V-shaped buccal capsule in lateral view, which is widest anteriorly and tapers posteriorly, while the buccal annulus of *Th. barkeri* lies at the base of the capsule (Beveridge 1981). Spicules of the new species are 1.70-2.22 mm long compared with 1.22-1.48 mm in *Th. arundeli*, 1.91-2.02 mm in *Th. thylonema*, and 1.48-1.70 mm in *Th. barkeri* (Beveridge 1981). *Thylonema woodalli* is distinguished from *Th. thylonema* by the shape of the buccal capsule, spicule lengths and the lack of prominent lateral lips bearing amphids in the new species.

Beveridge (1981) observed that the genus *Thylonema*, common in *T. stigmatica*, had not been found in *Thylogale thetis*. The present study documents *T. thetis* as a host for *Thylonema woodalli*. However, *Th. woodalli* was found in only one *T. thetis* of ten examined, compared with four of five *T. stigmatica wilcoxii* from the same region. It is possible, therefore, that *Th. woodalli* is an example of host-switching from *T. stigmatica* to *T. thetis* since both species are sympatric at the collection sites. It is interesting that the other three species within the genus have not been reported from *T. thetis* despite high prevalences of infection in sympatric populations of *T. stigmatica wilcoxii* (unpub.).

Thylonema woodalli was prevalent in *T. s. wilcoxii* in southeastern Queensland but was not reported by Beveridge *et al.* (1992) from *T. s. stigmatica* in northern Queensland. The current records include the occurrence of one male in *T. s. stigmatica* from the Atherton region, indicating that it is present in northern Queensland, though at a very low prevalence.

Thylonema clelandae sp. nov.
(FIGS 9-14)

Holotype: ♂, from stomach of *Thylogale stigmatica*

wilcoxii (M'Coy, 1866), Green Mountain, Lamington National Park Queensland, 1994, coll. P. Woodall, SAMA AHC 31296.

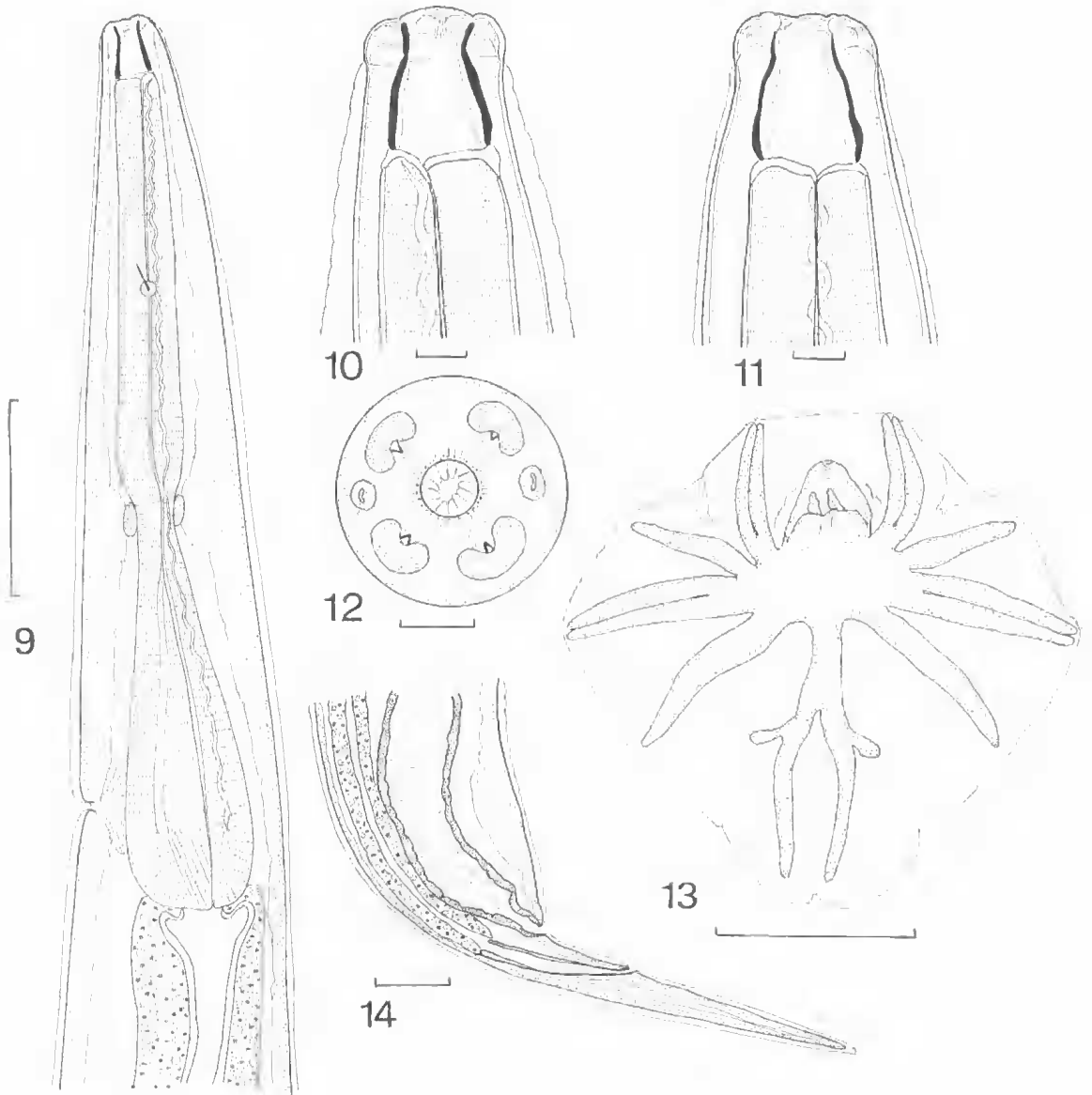
Allotype: ♀, SAMA AHC 31297.

Paratypes: 6 ♂♂, 3 ♀♀ AHC SAMA 31298.

Description

Small, white nematodes; body covered with

numerous fine annulations; mouth opening circular in apical view, with numerous lip-like structures projecting internally from anterior extremity of buccal capsule; two small amphids present; submedian cephalic papillae bilobed medially, rounded laterally; single short seta protruding medially between lobes; buccal capsule cylindrical; lumen of buccal capsule narrowing anteriorly; inner margin of buccal capsule sclerotised to level of cephalic collar, continuing to mouth opening;



Figs 9-14. *Thylonema clelandae* sp. nov. from the pademelon, *Thylagale stigmatica*. 9. Anterior end, lateral view. 10. Anterior extremity, lateral view. 11. Anterior extremity, dorsal view. 12. *En face* view of anterior extremity. 13. Bursa, apical view. 14. Female tail, lateral view. Scale bars = 0.1 mm, 9, 13-14; 0.01 mm, 10-12.

oesophagus elongate; corpus cylindrical, widening slightly posteriorly; isthmus short; bulb elongate, clavate, wider than corpus with distinctive oblique thickenings of the lining; nerve ring encircling oesophagus at isthmus; deirids slightly anterior to nerve ring; secretory-excretory pore anterior to oesophago-intestinal junction.

Male (Measurements of 8 specimens) (Figs 9-13)

Length 4.5-4.8 (4.6) mm, maximum width 200-340 (248); buccal capsule 17-20 (20) x 20-35 (28) in lateral view; oesophagus 425-465 (439); nerve ring to anterior end 245-260 (253); secretory-excretory pore to anterior end 370-590 (418); deirids to anterior end 235-285 (269); bursal lobes not well separated; ventral and lateral lobes joined, lateral lobes distinct from slightly longer dorsal lobe; ventral lobes joined ventrally; ventroventral and ventrolateral rays apposed, reaching margin of bursa; externolateral ray divergent from lateral trunk, almost reaching margin of bursa; mediolateral and posterolateral rays apposed, reaching margin of bursa; externodorsal ray arising close to the lateral trunk, not reaching margin of bursa; dorsal ray dividing at mid-length into two slender arcuate branches, almost reaching margin of bursa; two small, lateral branches arising soon after level of major bifurcation; spicules narrow, elongate, alate, 1.530-1.680 (1.576) mm; glae with fine transverse striations; anterior extremities of spicules irregularly knobbed; tips pointed; anterior lip of genital cone prominent, conical; posterior lip with two bulbous papillae; gubernaculum absent.

Female (Measurements of 4 specimens) (Fig. 14)

Length 5.05-5.39 (5.22) mm, maximum width 240-310 (268); buccal capsule 18-20 (19) x 25-28 (26) in lateral view; oesophagus 430-500 (456); nerve ring to anterior end 255-320 (275); secretory-excretory pore to anterior end 405-425 (410); deirids to anterior end 285 (285); tail short, conical, 300-335 (323) long; vulva immediately anterior to anus, 435-450 (444) from posterior end; ovejector longitudinally disposed; eggs thin-shelled, ellipsoidal, 70-90 (81) x 40-48 (43).

Site of infection

Stomach.

Etymology

Named in honour of Mrs B. La Nauze (née Cleland).

Remarks

The new species is allocated to *Thylonema* for the same reasons as those presented above for *Th.*

woodalli. *Thylonema clelandae* is distinguished from all congeners by the shape of the buccal capsule, which diminishes in diameter anteriorly and lacks a prominent annulus or thickening. The circular mouth opening in cross section, the lip-like projections of the buccal capsule into the mouth opening and the sclerotised folds within the oesophageal bulb also enable this species to be distinguished from congeners.

The buccal capsule of *Th. clelandae* is most similar to that of *Th. barkeri*. However, *Th. clelandae* lacks the characteristic annulus present at the base of the buccal capsule of *Th. barkeri*. The annulus occurs in the mid region of the buccal capsule of *Th. thylonema*, *Th. arundeli* and *Th. woodalli*. Spicules of the new species are 1.53-1.68 (1.58) mm long compared with 1.70-2.22 mm in *Th. woodalli*, 1.22-1.48 mm in *Th. arundeli*, 1.91-2.02 mm in *Th. thylonema* and 1.48-1.70 mm in *Th. barkeri* (Beveridge 1981).

The mouth opening of *Th. barkeri* is more rounded than in congeners and is sometimes folded to give the appearance of tiny lips or leaf crown elements, and therefore it is similar to that of *Th. clelandae*. However, true lip-like appendages are present only in the buccal capsule of *Th. clelandae*.

In *Th. clelandae*, the genital cone is complex, as in other species of *Thylonema*, with a prominent conical anterior lip and bulbous papillae on the posterior lip.

The genus *Thylonema* has until now been characterised both by distinctively shaped submedian papillae and the presence of a sclerotised annulus surrounding the buccal capsule. *Thylonema clelandae* lacks the annulus, though in some specimens the posterior part of the buccal capsule wall is slightly thicker than the anterior part. However, *Th. clelandae* possesses the characteristic cephalic papillae of the genus thereby confirming this character as its key distinguishing feature. The labial crown of numerous fine elements is a novel morphological character for the genus.

Thylostrongylus franklinae sp. nov.

(FIGS 15-23)

Holotype: ♂ from stomach of *Thylogale stigmatica wilcoxi*, Green Mountain, Lamington National Park Queensland, July 1994, coll. P. Woodall, SAMA AHC 31307.

Allotype: ♀, SAMA AHC 31308.

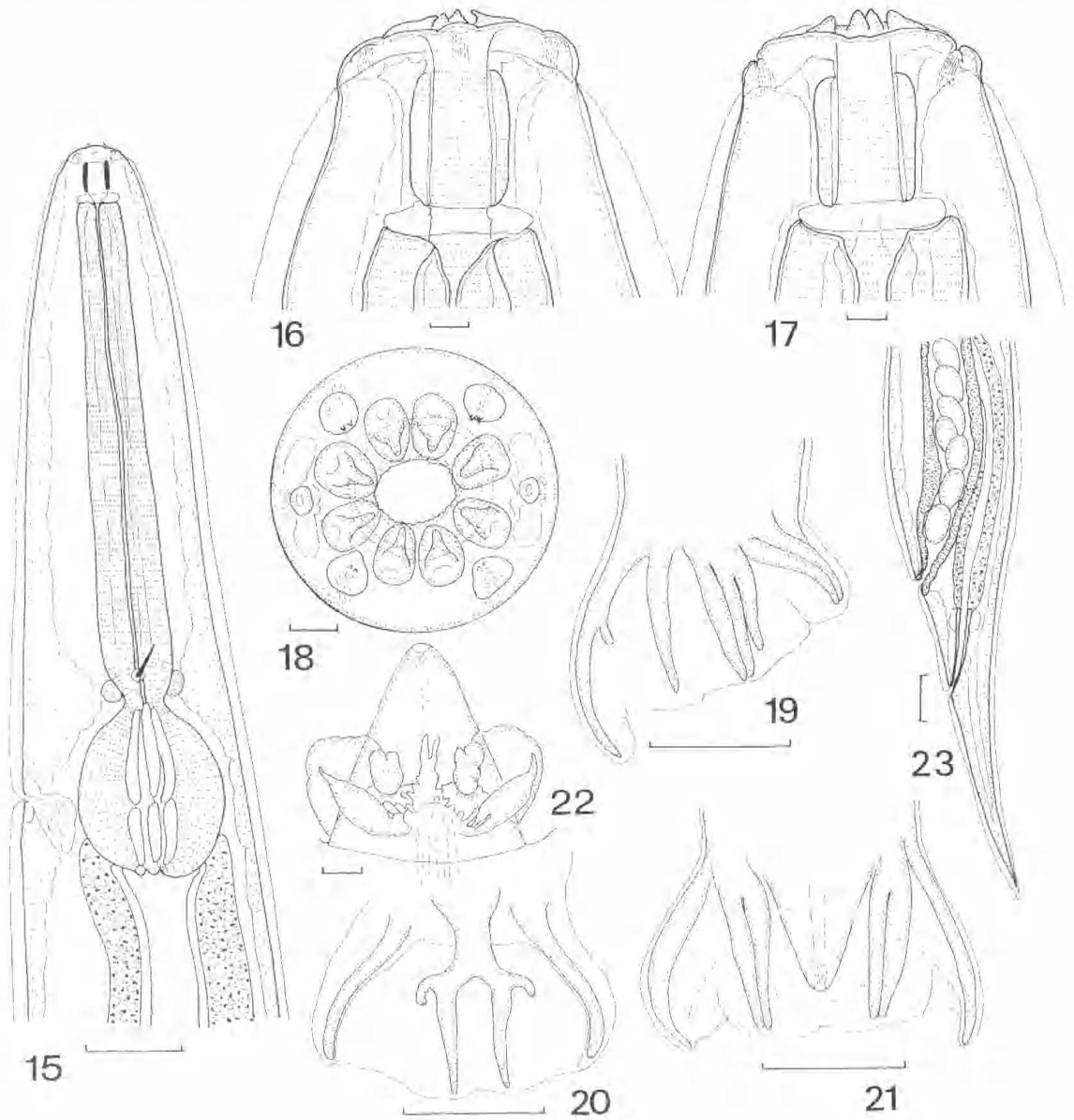
Paratypes: 2 ♂♂, 8 ♀♀, SAMA, AHC 31309.

Description

Small nematodes without alae or longitudinal body

striations; body covered, with numerous, fine transverse annulations; cephalic collar distinct, demarcated on anterior and posterior borders by transverse sutures; collar pierced by two amphids and four larger submedian papillae each bearing two stout setae; external labial crown with eight blunt-tipped sculptured petaloid elements, arising internally to cephalic collar; mouth circular in cross

section; buccal capsule cylindrical, subdivided longitudinally, slightly longer than wide, heavily sclerotised with numerous fine transverse striations; small cavity containing granular material surrounding anterior end of buccal capsule; oesophagus short, corpus cylindrical; isthmus short; bulb ovoid; lumen of bulb with elongate sclerotised plates; nerve ring encircling oesophagus at isthmus,



Figs 15-23, *Thylostrongylus franklinae* sp. nov. from the pademelon, *Thylogale stigmatica*. 15. Anterior end, lateral view. 16. Anterior extremity, lateral view. 17. Anterior extremity, ventral view. 18. En face view of anterior extremity. 19. Bursa, lateral view. 20. Dorsal and externodorsal rays of bursa, dorsal view. 21. Bursa, ventral view. 22. Genital cone, dorsal view. 23. Female tail, lateral view. Scale bars = 0.1 mm, 15, 19-21, 23; 0.01 mm, 16-18, 22.

secretory-excretory pore at level of nerve ring; deirids just anterior to pharyngo-intestinal junction; anterior projections of intestinal wall absent.

Male (Measurements of 3 specimens) (Figs 15-22)

Length 6.4-6.6 (6.5) mm, maximum width 290-320 (307); buccal capsule 35-40 (37) x 25 (25) in lateral view; oesophagus 640-690 (673); nerve ring to anterior end 510-560 (540); secretory-excretory pore to anterior end 660-680 (667); deirids to anterior end 580-590 (582); bursa short; lobes not separated from one another; no bosses or striations present on bursa; ventroventral and ventrolateral rays slender, apposed, reaching margin of bursa; medio-lateral and posterolateral rays long, thin, apposed reaching margin of bursa; externolateral ray divergent, shorter than other lateral rays, joining lateral trunk near origin, not reaching margin of bursa; externodorsal ray arising close to lateral trunk, reaching margin of bursa; dorsal ray stout in origin, dividing at $\frac{1}{2}$ length into two long, narrow branches; two short lateral branchlets leaving main branches at one half the total length; genital cone prominent; anterior lip conical, large with two large lateral appendages; 2 trilobed ventral appendages on dorsal aspect of cloaca; pair of large additional lateral appendages present; numerous projections decreasing in length from ventral to dorsal aspect around posterior lip, arranged radially around posterior lip; spicules slender, elongate, alate, 1.82-1.94 (1.88) mm; alae with numerous transverse striations, anterior extremities of spicules irregularly knobbed; distal tips pointed; alae tapering towards spicule tips; gubernaculum absent; cordate thickening present at junction of spicule sheaths; elongate thickenings present in ventral wall of spicule sheath, posterior to cordate thickening.

Female (Measurements of 9 specimens) (Fig. 23)

Length 6.3-7.5 (7.1) mm, maximum width 35-41 (37); buccal capsule 25-30 (28.9) x 35-45 (39) in lateral view; oesophagus 680-740 (710); nerve ring to anterior end 540-680 (587); secretory-excretory pore to anterior end 620-740 (677); deirids to anterior end 560-620 (580); tail long, gradually tapering to point, 370-500 (444); vulva immediately anterior to anus, 580-740 (651) from posterior end; vagina long, straight thick walled, 800-1150 (903), leading to longitudinally placed ovejector; eggs ellipsoidal, thin shelled, 70-110 (88) x 40-50 (46).

Site of infection

Stomach.

Etymology

Named in honour of Dr R. Franklin.

Remarks

This species belongs to the strongyloid subfamily Cloacinae Stossich, 1899, because it possesses a cylindrical buccal capsule, and a longitudinally disposed ovejector, the origin of the externodorsal ray is close to the lateral rays and there are two pairs of branches on the dorsal ray (Lichtenfels 1980). The species belongs to the genus *Thylostrongylus* Beveridge, 1982, because it has a distinct cephalic collar pierced by two amphids and four submedian papillae, an external labial crown of eight elements surrounding the mouth opening, a circular mouth opening and buccal capsule in cross section and elongate sclerotised plates lining the ovoid oesophageal bulb (Beveridge 1982).

Thylostrongylus franklinae differs from *Ts. parvus* in the proportions of the buccal capsule, which resemble more closely those of *Ts. tasmaniensis* (see Beveridge 1982). It differs from *Ts. tasmaniensis* in having prominent striations on the buccal capsule; in spicule length, in the origin of the dorsal ray and in overall size (Beveridge 1982). It differs from *Ts. parvus* and *Ts. tasmaniensis* in total length, maximum width, length from the nerve ring to anterior end, length from the secretory-excretory pore to the anterior end, length from the deirids to the anterior end, length of the spicules, length from the vulva to the posterior end, length of the tail and the size of the egg (Beveridge 1982). All measurements in *Th. franklinae* are substantially greater than those of *Ts. parvus* and *Ts. tasmaniensis* (Beveridge 1982). The cephalic papillae have two setae in *Ts. franklinae* as do those of *Ts. parvus*, whereas *Ts. tasmaniensis* has only one seta on each submedian papilla (Beveridge 1982). However, the setae are extremely difficult to see clearly.

Discussion

Species of the macropodid genus *Thylagule* have been reported to harbour a relatively diverse community of strongyloid nematodes (Beveridge *et al.* 1992). The helminth community includes a number of distinctive genera, which are found only within pademelons, for example *Thylamema* Beveridge 1981, *Trigonostonema* Beveridge 1981, *Cassanema* Beveridge & Johnson 1981, *Thylostrongylus* Beveridge 1982, *Tethystrongylus* Beveridge 1983, or occur primarily within pademelons with one or more exceptions occurring in other macropodid hosts, such as *Mimilonema* Beveridge & Johnson 1981, *Thudlosomema* Beveridge 1983 and *Wallabinema* Beveridge 1983. The three species described in this paper conform to genera which are found only as parasites of pademelons.

The addition of three new species to the spectrum

of helminth parasites described from pademelons supports the hypothesis that the pademelons harbour a distinctive nematode parasite fauna in comparison with other macropodid marsupials (Beveridge *et al.* 1992). The reasons for the relative diversity and distinctive parasitic community found within species of *Thylogale* are not clear.

Acknowledgments

I wish to thank P. Woodall (University of Queensland) for collection of specimens and I. Beveridge for help with initial identification and constructive comments on the manuscript and figures.

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